Claims

I Claim:

1. A process for the polymerization or copolymerization of propylene monomer, comprising:

providing a Ziegler-Natta catalyst, and in any order:

contacting the catalyst with an organoaluminum compound;

contacting the catalyst with at least one electron donor comprising a di-sec-butyldialkoxysilane simultaneously with or subsequent to contacting the catalyst with an organoaluminum compound, where the di-sec-butyldialkoxysilane has the formula $(^{s}Bu)_2Si(OR'')_2$, where R'' is independently a straight or branched alkyl group of 1-5 carbon atoms;

introducing the catalyst into a polymerization reaction zone containing the organoaluminum compound, the electron donor and propylene monomer; and

removing polypropylene homopolymer or copolymer from the polymerization reaction zone.

2. The process of claim 1 where the Ziegler-Natta catalyst comprises a transition metal compound of the formula MR_x where M is selected from the group consisting of titanium, chromium, and vanadium, R is selected from the group consisting of halogen or a hydrocarboxyl, and x is an integer up to and including the maximum valence of M as dictated by its position in the Periodic Table.

3. The process of claim 1 where the polypropylene homopolymer or copolymer removed from the polymerization reaction zone has xylene solubles ranging from about 0.5 to about 6 wt%.

4. The process of claim 1 where the polypropylene homopolymer or copolymer removed from the polymerization reaction zone has a polydispersity ranging from about 7 to about 11.

5. The process of claim 1 where the organoaluminum compound is an aluminum trialkyl co-catalyst of the formula AlR_3, where R is an alkyl group having 1 to 8 carbon atoms, with each R being the same or different.

6. The process of claim 5 where the organoaluminum co-catalyst is triethyl aluminum (TEAL).

7. The process of claim 1 where the Al/Si molar ratio (organoaluminum compound to silane donor) ranges from about 0.5 to about 500.

8. The process of claim 1 where the electron donor is present in an amount of from about 0.5 to about 500 ppm by weight of propylene monomer.

9. The process of claim 1 where the polymerization reaction zone additionally contains an olefin monomer other than propylene monomer.

10. The process of claim 1 further comprising contacting the catalyst with at least one molecular weight modifier.

11. The process of claim 1 where the electron donor is selected from the group consisting of di-sec-butyldimethoxysilane (DSBDMS), di-sec-butyldiethoxysilane (DSBDES), di-sec-butylmethoxyethoxysilane, and mixtures thereof.

12. A process for the polymerization or copolymerization of propylene monomer, comprising:

providing a Ziegler-Natta catalyst, where the Ziegler-Natta catalyst comprises a transition metal compound of the formula MR_x where M is selected from the group consisting of titanium, chromium, and vanadium, R is selected from the group consisting of halogen or a hydrocarboxyl, and x is an integer up to and including the maximum valence of M as dictated by its position in the Periodic Table, and in any order:

contacting the catalyst with an organoaluminum compound;

contacting the catalyst with at least one electron donor selected from the group consisting of di-sec-butyldimethoxysilane (DSBDMS), di-sec-butyldiethoxysilane (DSBDES), di-sec-butylmethoxyethoxysilane, and mixtures thereof, simultaneously with or subsequent to contacting the catalyst with an organoaluminum compound;

contacting the catalyst with at least one molecular weight modifier;

introducing the catalyst into a polymerization reaction zone containing the organoaluminum compound, the electron donor, the molecular weight modifier, and propylene monomer; and

removing polypropylene homopolymer or copolymer from the polymerization reaction zone

where the Al/Si molar ratio (organoaluminum compound to silane donor) ranges from about 0.5 to about 500.

13. The process of claim 12 where the polypropylene homopolymer or copolymer removed from the polymerization reaction zone has xylene solubles ranging from about 0.5 to about 6 wt%.

14. The process of claim 12 where the polypropylene homopolymer or copolymer removed from the polymerization reaction zone has a polydispersity ranging from about 7 to about 11.

15. The process of claim 12 where the organoaluminum compound is an aluminum trialkyl co-catalyst of the formula AlR_3, where R is an alkyl group having 1 to 8 carbon atoms, with each R being the same or different.

16. The process of claim 15 where the organoaluminum co-catalyst is triethyl aluminum (TEAL).

17. The process of claim 12 where the electron donor is present in an amount of from about 0.5 to about 500 ppm by weight of propylene monomer.

18. A catalyst system for the polymerization or copolymerization of olefins comprising:

a Ziegler-Natta catalyst;

an organoaluminum compound co-catalyst; and

at least one external electron donor comprising a di-sec-butyldialkoxysilane having the formula $(^{s}Bu)_2Si(OR'')_2$, where R'' is independently a straight or branched alkyl group of 1-5 carbon atoms.

19. The catalyst of claim 18 where the Ziegler-Natta catalyst comprises a transition metal compound of the formula MR_x where M is selected from the group consisting of titanium, chromium, and vanadium, R is selected from the group consisting of halogen or a hydrocarboxyl, and x is an integer up to and including the maximum valence of M as dictated by its position in the Periodic Table.

20. The catalyst of claim 18 where in contacting the catalyst with an organoaluminum compound, the organoaluminum compound is triethyl aluminum (TEAL).

21. The catalyst of claim 18 where the Al/Si molar ratio (organoaluminum compound to silane donor) ranges from about 0.5 to about 500.

22. The catalyst of claim 18 where the external electron donor is selected from the group consisting of di-sec-butyldimethoxysilane (DSBDMS), di-sec-butyldiethoxysilane (DSBDES), di-sec-butylmethoxyethoxysilane, and mixtures thereof.

23. A catalyst system for the polymerization or copolymerization of olefins comprising:

a Ziegler-Natta catalyst, where the Ziegler-Natta catalyst comprises a transition metal compound of the formula MR_x where M is selected from the group consisting of titanium, chromium, and vanadium, R is selected from the group consisting of halogen or a hydrocarboxyl, and x is an integer up to and including the maximum valence of M as dictated by its position in the Periodic Table;

an organoaluminum compound co-catalyst; and

at least one external electron donor selected from the group consisting of di-sec-butyldimethoxysilane (DSBDMS), di-sec-butyldiethoxysilane (DSBDES), di-sec-butylmethoxyethoxysilane, and mixtures thereof,

where the Al/Si molar ratio (organoaluminum compound to silane donor) ranges from about 0.5 to about 500.

24. The catalyst of claim 23 where the organoaluminum compound is triethyl aluminum (TEAL).

25. Polypropylene comprising a propylene polymer or copolymer having a melt flow ranging from about 1-100 decigrams/min., a polydispersity ranging from about 7 to about 11, and xylene solubles ranging from about 0.5 to about 6 wt%.

26. Polypropylene formed by a process comprising:

providing a Ziegler-Natta catalyst, and in any order:

contacting the catalyst with an organoaluminum compound;

contacting the catalyst with at least one electron donor comprising a di-sec-butyldialkoxysilane simultaneously with or subsequent to contacting the catalyst with an organoaluminum compound, where the di-sec-butyldialkoxysilane has the formula $(^{s}Bu)_2Si(OR'')_2$, where R'' is independently a straight or branched alkyl group of 1-5 carbon atoms;

introducing the catalyst into a polymerization reaction zone containing the organoaluminum compound, the electron donor and propylene monomer; and

removing polypropylene homopolymer or copolymer from the polymerization reaction zone.

27. The polypropylene of claim 26 where the polypropylene has a higher polydispersity and higher bulk density as compared to an otherwise identical polypropylene formed in the absence of a di-sec-butyldialkoxysilane.

28. An article formed from polypropylene comprising a propylene polymer or copolymer having a melt flow ranging from about 1-100 decigrams/min. and xylene solubles of not more than about 6% formed by a process comprising:

providing a Ziegler-Natta catalyst, and in any order:

contacting the catalyst with an organoaluminum compound;

contacting the catalyst with at least one electron donor comprising a di-sec-butyldialkoxysilane simultaneously with or subsequent to contacting the catalyst with an organoaluminum compound, where the di-sec-butyldialkoxysilane has the formula $(^{s}Bu)_2Si(OR'')_2$, where R'' is independently a straight or branched alkyl group of 1-5 carbon atoms;

introducing the catalyst into a polymerization reaction zone containing the organoaluminum compound, the electron donor and propylene monomer; and

removing polypropylene homopolymer or copolymer from the polymerization reaction zone.

29. The article of claim 28 where the article is biaxially oriented polypropylene (BOPP) film.

30. The article of claim 28 where the article is high crystallinity polypropylene (HCPP).